



Urban Upland / Groundwater Source Category Group (UGSCG)

Overview Presentation

September 11, 2007

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Purpose and Background

- Inform pollutant load reduction estimates for urban storm water runoff, including infiltration to groundwater
- Watershed Model simulations use UGSCG input to estimate pollutant load reductions for surface water
- Groundwater estimates conducted independent of Watershed Model simulations

Key Steps in Approach (Surface Runoff)

Step 1: PCO Evaluation

Step 2: Site-Scale Analysis

- Define Urban Upland Settings
- Develop Treatment Tiers by Setting

Step 3: Basin-Wide Analysis

- Provide input to Watershed Model
- Watershed Model simulations estimate pollutant load reductions

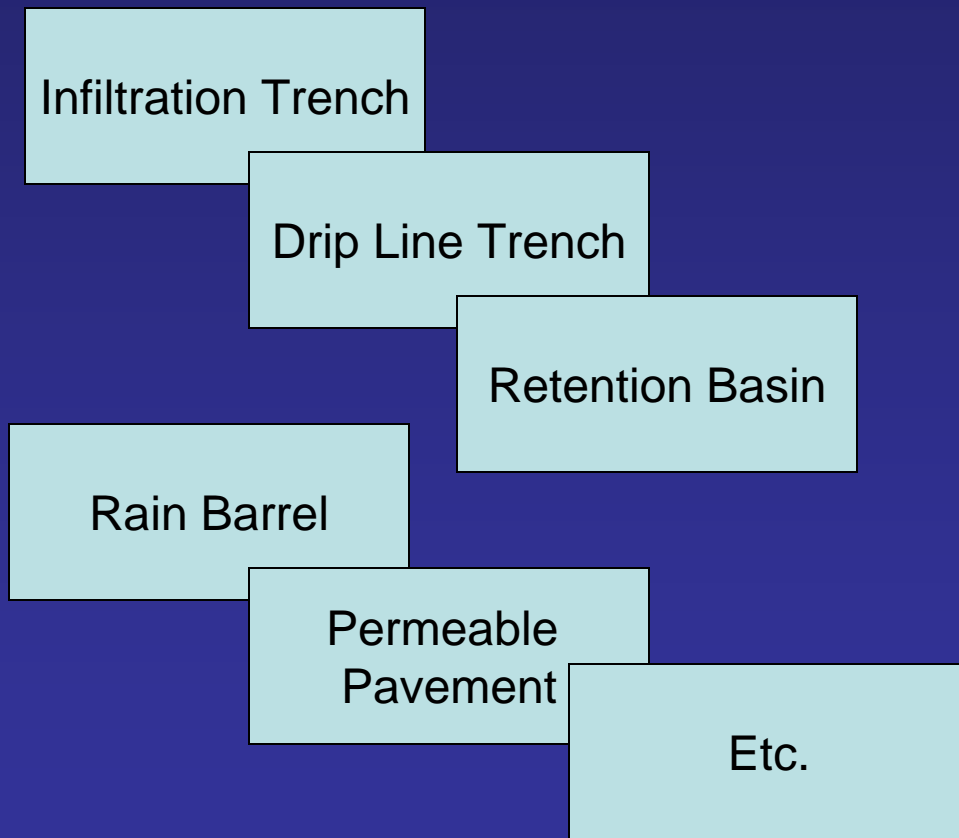
PCO Considerations

- Large number of BMPs are applicable to urban uplands and groundwater
- BMPs are typically applied in various combinations, configurations, and sizes depending on site conditions
- Potentially creates an unmanageable number of alternatives

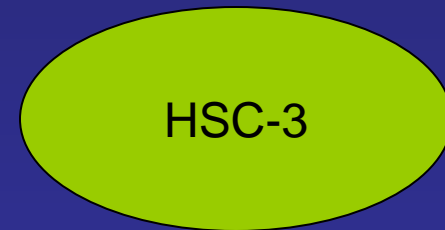
PCO Development

A single PCO represents multiple BMPs having similar function and process

Multiple BMPs



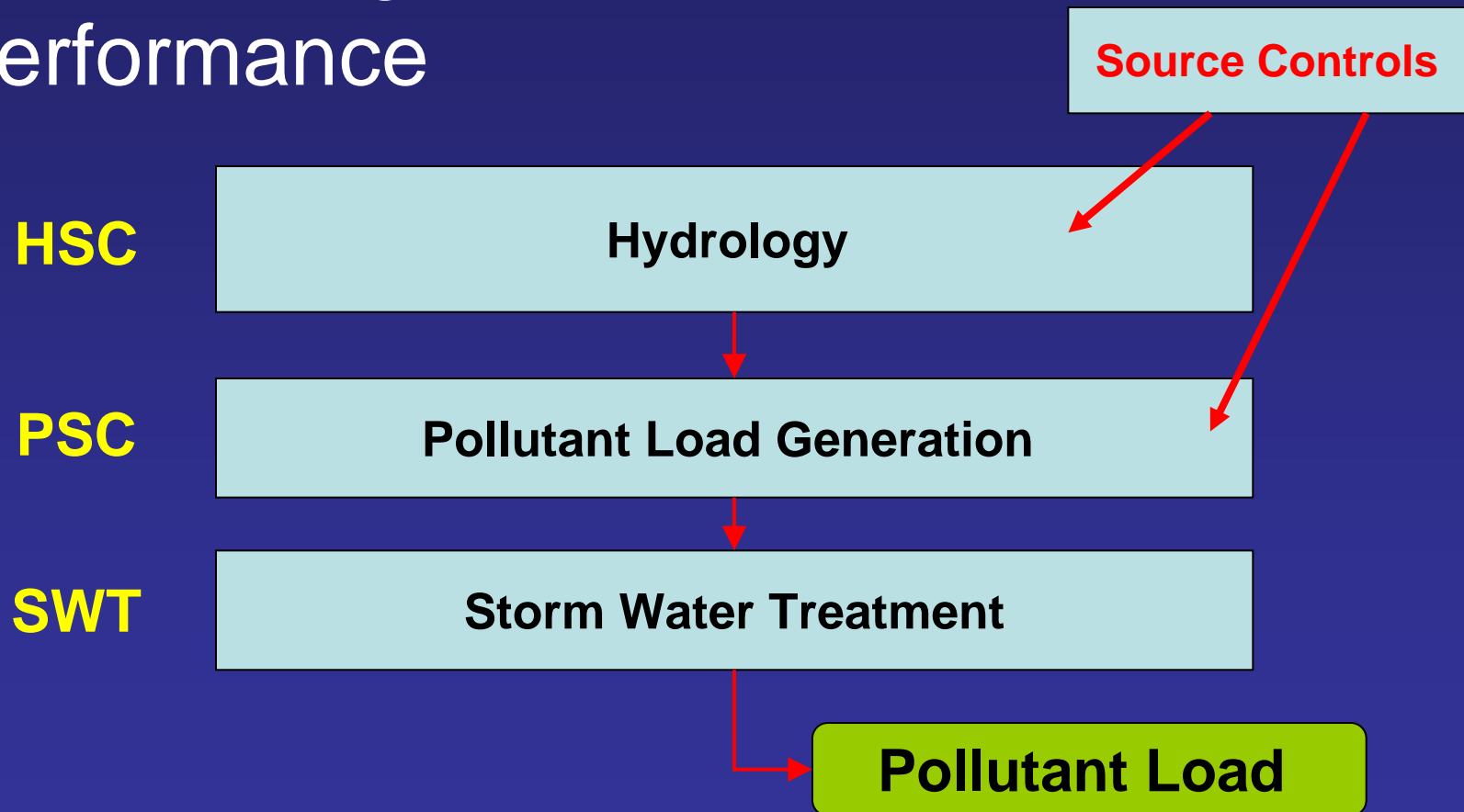
PCO



Function - Private BMPs that detain and infiltrate runoff

PCO Performance Estimates

- PCOs categorized to estimate performance



PCO Performance Estimates (cont.)

- Pollutant Source Controls
 - Represented by adjustments to existing condition EMCs by land use
 - Tahoe Basin storm water data and other applicable data applied
 - Aggregation of multiple BMPs improves land use condition
 - Best professional judgment applied

PCO Performance Estimates (cont.)

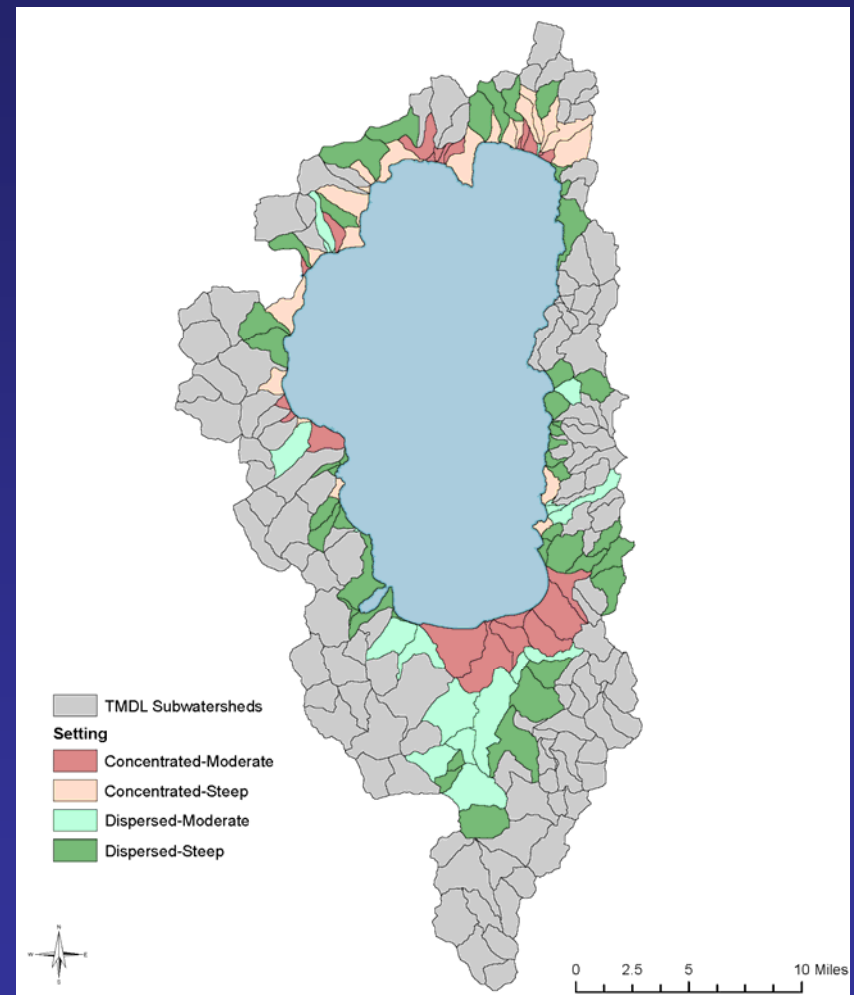
- Hydrologic Source Control
 - Specified storage volume and infiltration rate
 - Capture ratios computed
- Storm Water Treatment
 - Median effluent quality from Tahoe storm water monitoring data and ASCE database
 - Capture ratios computed

Urban Upland Settings

- Settings classify subwatersheds to guide potential PCO applications
- Settings based on two key physiographic characteristics
 - Impervious area configuration
 - Average slope of urban area
- Many other performance factors captured by Watershed Model (e.g., meteorology, land use, soils, etc.)

Urban Upland Settings

- 4 Settings defined
 - Concentrated-Steep
 - Concentrated-Moderate
 - Dispersed-Steep
 - Dispersed-Moderate
- Settings recognized to not represent project implementation scale



Treatment Tiers

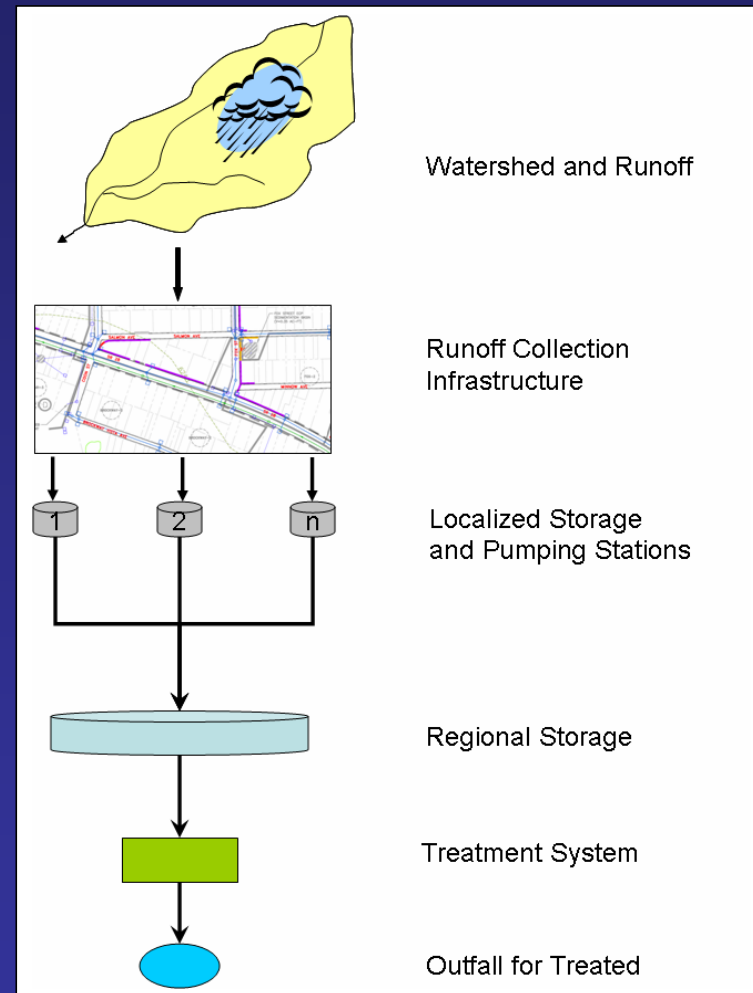
- Conceptual combinations of PCOs applicable to a particular Setting
- Two standard Treatment Tiers defined
- Represent steps or levels in expected water quality performance and cost
 - Tier 1: Similar to existing practice
 - Tier 2: Tier 1 plus increased spatial scale of PCO implementation and more advanced PCOs applied

Treatment Tier Example

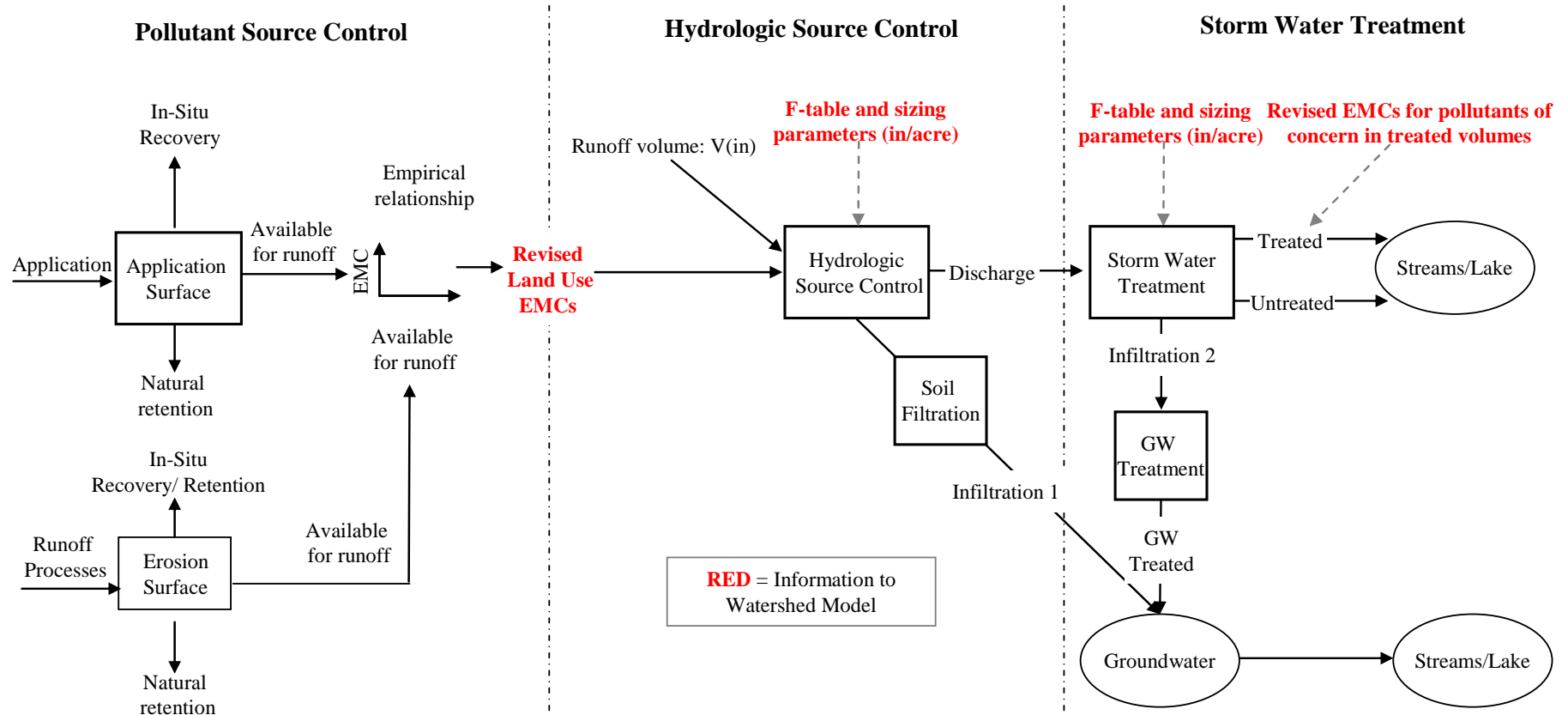
PCO	Description of PCO Function	Spatial Scale of Application		Rationale for Spatial Scale of PCO Application and Key Assumptions	
		Tier 1	Tier 2	Tier 1	Tier 2
PSC-1A	Road drainage system stabilization; distributed collection of pollutants; Road abrasives application reductions, maintenance and operations	50%	0%	Road shoulders parallel to slope stabilized; road shoulders perpendicular to slope not stabilized	Not applied
PSC-1B	PSC1A plus increased maintenance and operations; Use of alternative deicers; Use of advanced road abrasive collection technology	0%	100%	Not applied	Standard assumption for Tier 2 treatment tier
HSC-2	Decrease runoff reaching outlet in steep sloped catchments	15%	30%	Select opportunities to disperse runoff while considering physical constraints	Tier 1 plus additional drainage infrastructure to disconnect and disperse runoff
HSC-3	Private BMP implementation to detain and infiltrate runoff	50%	100%	Standard assumption for Tier 1	Standard assumption for Tier 2
SWT-2A	Mechanical separation	40%	0%	Slopes limit opportunities for runoff capture	Not applied
SWT-2B	Mechanical separation with media filtration	0%	100%	Not applied	Extensive subsurface construction for treatment

Pump and Treat Tier

- Developed specialized treatment tier
- Collection and pumping of storm water to a regional treatment plant
- Applied in concentrated settings



PCO Performance Informing Watershed Model Simulations



Preliminary Results (Surface Water)

Estimated Average Annual Load Reduction (Metric Tons)

Setting	Pollutant of Concern	Tier 1	Tier 2	Pump & treat
Concentrated-moderate	Fines < 63 µm	520	1,200	1,100
	Total Nitrogen	5.6	13	6.9
	Total Phosphorus	1.3	2.1	2
Concentrated-steep	Fines < 63 µm	310	760	670
	Total Nitrogen	2.3	6.2	3.7
	Total Phosphorus	0.8	0.7	1.2
Dispersed-moderate	Fines < 63 µm	160	400	n/a
	Total Nitrogen	1.6	5.2	n/a
	Total Phosphorus	0.4	1	n/a
Dispersed-steep	Fines < 63 µm	200	520	n/a
	Total Nitrogen	1.2	4.8	n/a
	Total Phosphorus	0.5	1.1	n/a

Groundwater Background

- Key question:
 - What is the impact of urban storm water infiltration on groundwater nutrient loading to the Lake?
- Estimated changes to groundwater loads independent of Watershed Model
- Baseline conditions assumed from Groundwater Framework Study for Lake Tahoe (ACOE 2003)
- Mass balance approach used

Key Steps in Approach (Groundwater)

1. SWMM used to quantify infiltrated volumes
2. Compared and related SWMM results to ACOE (2003) for baseline conditions
3. Used SWMM to estimate changes in infiltrated volumes for Tier 1 and Tier 2 implementation
4. Applied estimates of Tier 1 and Tier 2 characteristic runoff quality infiltrated
5. Developed estimates of pollutant loads to groundwater

Preliminary Results (Groundwater)

2007 Nutrient Budget	DN (MT/yr)	DP (MT/yr)
Groundwater contribution	35.7	4.9
% of total annual load to Lake Tahoe	17%	36%
Treatment tier	DN load reduction (MT/yr)	DP load reduction (MT/yr)
<i>Urban Upland Storm Water PCOs</i>		
Tier 1	(0.1)	0.2
Tier 2	2	0.87
<i>Sewage System Maintenance</i>		
Tier 1	0.3	0.03
Tier 2	0.6	0.06
<i>In-situ Groundwater Treatment</i>		
Tier 2	not evaluated	0.28

Text in parenthesis indicates an estimated increase in annual load